

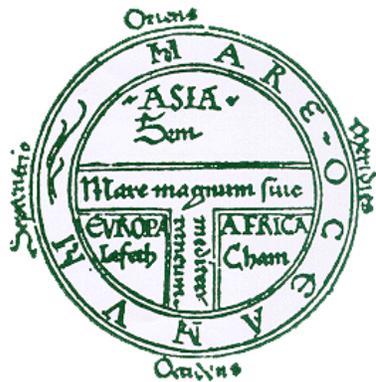
Exploring Maps - Poster Side 2

Ca. 450 B.C. *The Odyssey*

Now the great seaman, leaning on his oar, steered all night unsleeping, and his eyes picked out Pleiades, the laggard Ploughman, and the Great Bear, that some have called the Wain, pivoting in the sky before Orion; of all the night's pure figures, she alone would never bathe or dip in the Ocean stream. These stars the beautiful Kalypso bade him hold on his left hand as he crossed the main.

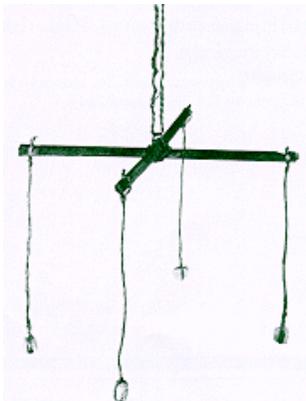
Homer: a Greek poet thought to have lived in the 8th Century B.C. *The Odyssey* depicts the wanderings of Odysseus on his homeward journey from the Trojan War.

Homer. *The Odyssey*. Translated by Robert Fitzgerald, Garden City, New York: Vintage Books, 1961, p. 83.



Sixth century—Isidore of Seville, World Map. Ninth-century version of the map showing Jerusalem at the center of the Universe.

Courtesy of the Newberry Library



330-23 B.C.—Egyptian groma or surveyor's cross from the Ptolemaic period. This sighting tool was used to establish right angles.

Crown copyright: Courtesy of the Science Museum, London

1387-92 *The Canterbury Tales*

When April with his showers sweet with fruit the drought of March has pierced unto the root And bathed each vein with liquor that has power

To generate therein and sire the flower;
When Zephyr also has, with his sweet breath,
Quickened again, in every hold and heath,
The tender shoots and buds, and young sun
Into the Ram one half his course has run, . . .

Then do folk long to go on pilgrimage,
And palmers to go seeking out strange strands,
To distant shrines well known in sundry lands.

And specially from every shire's end
Of England they to Canterbury wend,
The holy blessed martyr there to seek
Who helped them when they lay so ill and weak.

Geoffrey Chaucer, ca.1340-1400: A diplomat, civil servant, and poet, Chaucer wrote *The Canterbury Tales* in the 1390's. In it, a group of pilgrims gather at the Tabard Inn near London and agree to engage in a storytelling contest as they travel by horseback to the shrine of Thomas à Becket in Canterbury. Chaucer's knowledge of medieval astrology and how it influenced human behavior is reflected in the *Tales*.

Chaucer, Geoffrey. *The Canterbury Tales*. New York: International Collector's Library, 1934, p.1.

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1492 A journal of Christopher Columbus' voyage

Sunday 9 September

He made 15 leagues that day and he decided to report less than those actually traveled so in case the voyage were long the men would not be frightened and lose courage. In the night they made 120 miles at ten miles per hour, which is 30 leagues. The sailors steered badly, straying to the west by north and even to the half division [i.e. west-northwest], because of which the Admiral rebuked them many times.



1519—Christopher Columbus. Portrait by Sebastiano del Piombo.

Courtesy of the Metropolitan Museum of Art

Monday 17 September

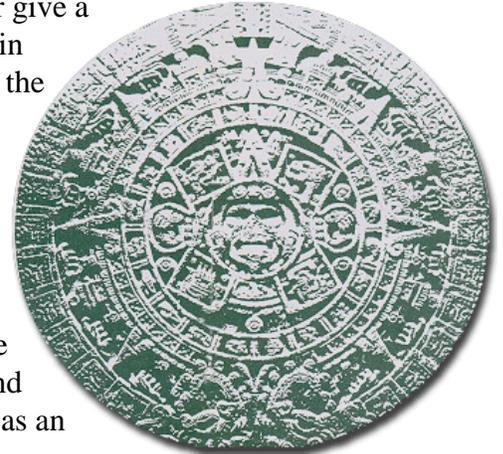
He sailed on his route west and made, day and night, somewhat more than 50 leagues. He put down but 47. The current was helping them. They saw much weed and very often and it was vegetation from rocks and it came from a westerly direction; they judged themselves to be near land. The pilots took the north, marking it, and found that the compasses northwestered a full point [i.e., eleven and one-quarter degrees]; and the sailors were fearful and depressed and did not say why. The Admiral was aware of this and he ordered that the north again be marked when dawn came, and they found that the compasses were correct.

Thursday 11 October

. . . . And because the caravel *Pinta* was a better sailer and went ahead of the Admiral it found land and made the signals that the Admiral had ordered. A sailor named Rodrigo de Triana saw this land first, although the Admiral, at the tenth hour of the night, while he was on the sterncastle, saw a light, although it was something so faint that he did not wish to

affirm that it was land . . . After the Admiral said it, it was seen once or twice; and it was like a small wax candle that rose and lifted up, which to few seemed to be an indication of land. But the Admiral was certain that they were near land, because of which when they recited the *Salve*, which sailors in their own way are accustomed to recite and sing, all being present, the Admiral entreated and admonished them to keep a good lookout on the forecastle and too watch carefully for land; and that to the man who first told him that he saw land he would later give a

silk jacket in addition to the other rewards that the sovereigns had promised, which were ten thousand *maravedis* as an annuity to whoever should see it first. At two hours after



midnight the land appeared, from which they were about two leagues distant.

11th-16th century—Sun Stone. This 26-ton basalt stone from Tenochtitlán, the Aztec capital, was a solar and astronomical calendar.

Courtesy of the Museo Nacional de Antropología, Mexico City

Christopher Columbus, 1451-1506: Columbus was a Genoese sailor who convinced Spain's King Ferdinand and Queen Isabella to finance a mission to reach the Indies by sailing westward from Europe. His estimate of the short distance to the Indies was influenced by miscalculations of the Earth's diameter by Ptolemy, and by apocryphal Biblical accounts. Columbus made four voyages to the new world, in 1492, 1493, 1498, and 1502.

Dunn, Oliver, and Kelley, James, ed. *The Diario of Christopher Columbus' First Voyage, 1492-1493*. Norman, Oklahoma: University of Oklahoma Press, 1989, pp. 29, 33, 63.

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1520 Magellan circumnavigates the globe

On Wednesday the twenty-eighth of November, one thousand five hundred and twenty, we issued forth from the said strait and entered the Pacific Sea, where we remained three months and twenty days without taking on board provisions or any other refreshments, and we ate only old biscuits turned to powder, all full of worms and stinking of the urine which the rats had made on it, having eaten the good. And we drank water impure and yellow. We ate also ox hides which were very hard because of the sun, rain, and wind. And we left them . . . days in the sea, then laid them for a short time on embers, and so we ate them. And of the rats, which were sold for half an écu apiece, some of us could not get enough.

Besides the aforesaid troubles, this malady [scurvy] was the worst, namely that the gums of most part of our men swelled above and met below so that they could not eat. And in this way they died, inasmuch as twenty-nine of us died But besides those who died, twenty-five or thirty fell sick of divers maladies, whether of the arms or of the legs and other parts of the body [also effects of scurvy], so that there remained very few healthy men. Yet by the grace of our Lord I had no illness.

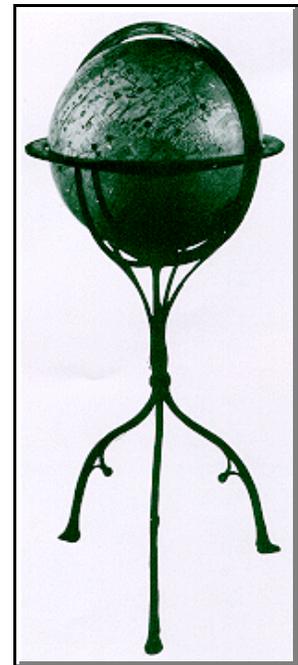
During these three months and twenty days, we sailed in a gulf where we made a good four thousand leagues across the Pacific Sea, which was rightly so named. For during this time we had no storm, and we saw no land except two small uninhabited islands, where we found only birds and trees. Wherefore we called them the Isles of Misfortune . . .

On Friday the twenty-sixth of April Zzula, lord of the aforesaid island of Mattan, sent one of his sons to present to the captain-general two goats, saying that he would keep all his promises to him, but because of the lord. . . Cilapulapu (who refused to obey the King of Spain) he had not been able to. . . And he begged that on the following night he [Magellan] would send but one boat with some of

his men to fight.

The captain-general resolved to go there with three boats. And however strongly we besought him not to come, yet . . . at midnight we set forth, sixty men armed with corselets and helmets . . . and we so manage that we arrived at Mattan three hours before daylight. The captain would not fight at this hour, but sent . . . to tell the lord of the place [Cilapulapu] and his people that, if they agreed to obey the King of Spain, and recognize the Christian king as their lord, and give us tribute, they should all be friends. But if they acted otherwise they should learn by experience how our lances pierced. They replied that they had lances of bamboo hardened in the fire and stakes dried of the fire, and that we were to attack them when we would . . .

Having thus reached land we attacked them. Those people had formed three divisions, of more than one thousand and fifty persons . . . and thus we began to fight . . . They fired at us so many arrows, and lances of bamboo tipped with iron, and pointed stakes hardened by fire, and stones, that we could hardly defend ourselves They came so furiously against us that they sent a poisoned arrow through the captain's leg. Wherefore he ordered us to withdraw slowly,



1492—Martin Behaim. Terrestrial globe. Based on contemporary sea charts, the map was glued to a papier-mâché shell.

Facsimile globe from the American Geographical Society Collection, University of Wisconsin-Milwaukee Library

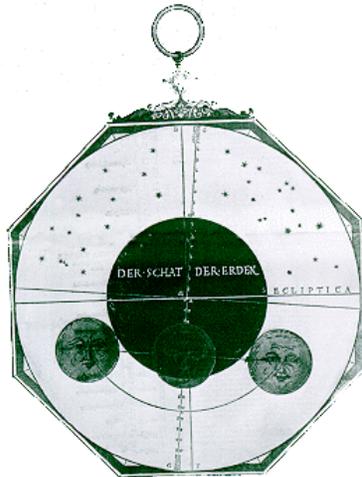
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but the men fled while six or eight of us remained with the captain . . . as a good captain and a knight he still stood fast with some others, fighting thus for more than an hour. And as he refused to retire further, an Indian threw a bamboo lance in his face, and the captain immediately killed him with his lance, leaving it in his body. Then, trying to lay hand on his sword, he could draw it out but halfway, because of a wound from a bamboo lance that he had in his arm. Which seeing, all those people threw themselves on him, and one of them with a large javelin . . . thrust it into his left leg, whereby he fell face downward. On this all at once rushed upon him with lances of iron and of bamboo and . . . they slew our mirror, our light, our comfort, and our true guide.

Ferdinand Magellan, 1480-1521: Sailing westward, he sought to prove that the Spice Islands lay to the west of the Papal Line of Demarcation established in 1494, and thus could be claimed by Spain. After a harrowing passage through the straights at the southern tip of South America that now bear his name, Magellan traversed the Pacific. Although he lost his life in the Phillipines, the expedition went on to become the first to circumnavigate the globe.

Pigafetta, Antonio, journal, quoted in Skelton, R.A., *Magellan's Voyage—A narrative Account of the First Circumnavigation*. New Haven: Yale University Press, 1969, pp. 723, 733, 739, 742.

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1540—Peter Apian. Eclipses of the Sun and Moon. The page is a wheel that can be rotated to predict eclipses.

Courtesy of the Pierpont Morgan Library

1524-1528 Verrazzano enters New York harbor

In space of 100 leagues sailing we found a very pleasant place, situated amongst certain little steep hills; from amidst the which hills there ran down into the sea a great stream of water, which within the mouth was very deep, and from the sea to the mouth of same, with the tide, which we found to rise 8 foot, any great vessel laden may pass up . . . But because we rode at anchor in a place well fenced from the wind, we would not venture ourselves without knowledge of the place, and we passed up with our boat only into the said river, and saw the country very well peopled. The people are almost like unto the others, and clad with feathers of fowls of divers colors. They came towards us very cheerfully, making great shouts of admiration, showing us where we might come to land most safely with our boat. We entered up the said river into the land about half a league, where it made a most pleasant lake about 3 leagues in compass; on the which they rowed from the one side to the other, to the number of 30 of their small boats, wherein were many people, which passed from one shore to the other to come and see us. And behold, upon the sudden (as it is wont to fall out in sailing) a contrary flaw of wind coming from the sea, we were enforced to return to our ship, leaving this land, to our great discontentment for the great commodity and pleasantness thereof, which we suppose is not without some riches, all the hills showing mineral matters in them.

Giovanni da Verrazzano, 1485-1528: Verrazzano was an Italian navigator who, under the auspices of France's King Francis I, explored the northeast coast of North America from Cape Fear to New York harbor in 1524.

Morison, S. E. *The Great Explorers—The European Discovery of America*, Oxford: Oxford University Press, 1978, p. 153.

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ca.1580 Mercator's letter to Ortelius

1574—Gerardus Mercator. Portrait served as frontispiece to Mercator's *Atlas sive Cosmographicae*, 1585-95, and shows him taking a measurement from a globe.

Courtesy of the Rare Book and Special Collections Division, Lessing J. Rosenwald Collection, Library of Congress



Greetings to Master Ortelius, the best of friends

Your letter afforded me great pleasure, first because you have obtained what you have wanted for a long time about China, secondly because of the dispatch about the new English voyage, on which you had previously sent me a report through Rumold [Mercator]. I am persuaded that there can be no reason for so carefully concealing the course followed during this voyage, nor for putting out differing accounts of the route taken and the areas visited, other than that they must have found very wealthy regions never yet discovered by Europeans, not even by those who have sailed the Ocean on the Indies voyages. That huge treasure in silver and precious stones which they pretend they secured through plunder is, in any case, an argument for me to suspect this I think that that fleet cannot have returned by any route except one via the north and west of Asia, for that strait which encloses the

northern parts of America to within only a few degrees on a great circle westward from Greenland . . . is obstructed by many rocks. So it does not seem likely that Drake would have tried it, especially if he came back from Asia so loaded down with treasure

Duisburg, 12 December 1580

Ever yours
Gerard Mercator

[Addressed] To Master Abraham Ortelius,
Cosmographer Royale, at Antwerp.

Gerardus Mercator, 1512-1594: Flemish cartographer whose maps and globes exhibited the best scientific knowledge of his time. Mercator, best known for his map projection, also invented the term "atlas" for a collection of maps. This letter, addressed to Abraham Ortel (also called Ortelius, 1527-1908) another Flemish cartographer, refers to the 1577-1580 circumnavigation of the Earth by the English admiral Sir Francis Drake.

Krause, Hans Peter. *Sir Francis Drake—A Pictorial Biography*. New York: H.P. Kraus, 1970, pp. 86, 88.



1669—Cross staff. Engraving from an instructional text. Used to measure location by aligning AC with the sun and AB with the horizon. The resulting angle gave latitude.

Courtesy of the National Maritime Museum, London

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1610 The Galilean satellites of Jupiter

On the seventh day of January in this present year 1610, at the first hour of night. when I was viewing the heavenly bodies with a telescope, Jupiter presented itself to me. And because I had prepared a very excellent instrument for myself, I perceived (as I had not done before on account of weakness of my previous instrument) that there were three starlets beside the planet, small indeed, but very bright.



1610—Galileo Galilei's notebook recording the positions of Jupiter's satellites.

Courtesy of Biblioteca Nazionale, Florence

Though I believed them to belong to the host of fixed stars, they somewhat aroused my curiosity by their appearing to lie in an exact straight line parallel to the ecliptic, and by their being more splendid than other stars their size. Their arrangement with respect to Jupiter and to each other was as follows:



That is, there were two stars on the easterly side and one to the west; the more easterly star and the western one looked larger than the other. I paid no attention to the separations between them and from Jupiter, since at the outset I thought them to be fixed stars, as said before.

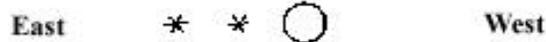
But returning to the same investigation on the eighth of January, led by I know not what, I found a very different arrangement. The three starlets were now all to the west of Jupiter, closer together, and at

equal intervals from one another as shown below:



At this time I did not yet turn my attention to the manner in which the starlets had gathered together, but I did begin to concern myself with the question how Jupiter could be east of all these stars when on the previous night it had been west of two of them. I commenced to wonder whether Jupiter might not be moving eastward at this time, contrary to the computations of astronomers, and had got in front of them by that motion

On the tenth of January . . . the stars appeared in this position with respect to Jupiter:



That is, there were but two of them, both easterly, the third (as I supposed) being hidden behind Jupiter. As at the beginning, they were in the same straight line with Jupiter and arranged exactly in the line of the zodiac. Noticing this, and knowing that there was no way in which such alterations could be attributed to Jupiter's motion [alone], yet being certain that these were still the same stars I had observed [before]—in fact, no other star was to be found along the line of the zodiac for a long distance on either side of Jupiter—my perplexity was now turned into amazement. Certain that the apparent changes belonged not to Jupiter but to the observed stars, I resolved to pursue this investigation with greater care

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and attention. And thus, on the eleventh of January, I saw the following disposition:

East ✱ ○ West

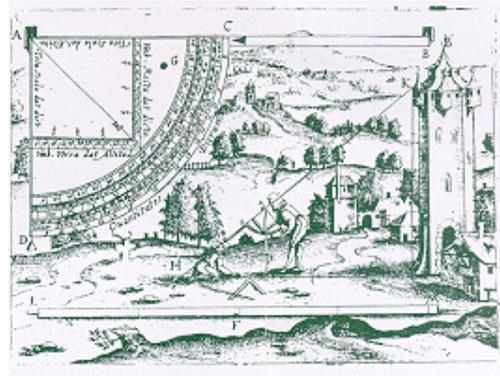
There were two stars, both to the east, the central one being three times as far from Jupiter as from the star farther east. The last-named star was nearly double the size of the other, whereas on the night before they had appeared about equal.

I now decided beyond all doubts that there existed in the heavens three stars wandering about Jupiter as do Venus and Mercury about the sun, and this became plainer than daylight from observations on the occasions that followed I measured the distances between the [the starlets] by means of the telescope, using the method explained earlier. Moreover, I recorded the times of observations especially when more than one was made on the same night; for the revolutions of these planets are so swiftly completed that it is usually possible to note even their hourly changes.

Galileo Galilei, 1564-1642: An Italian mathematician, astronomer, and physicist, Galileo was the first to use a telescope to study the skies. He amassed evidence that proved the Earth revolved around the sun and was not the center of the universe. His observations of the positions of Jupiter's satellites were used to calculate longitude on the Earth.

Galileo Galilei, "The starry messenger," in Drake, Stillman. *Telescopes, Tides, and Tactics*. Chicago: University of Chicago Press, 1983, pp. 58-62.

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16th century

Surveyors from the title page of a book by Levinus Hondius on the theory and practice of surveying.

Courtesy of the Rare Book and Special Collections Division, Lessing J. Rosenwald Collection, Library of Congress

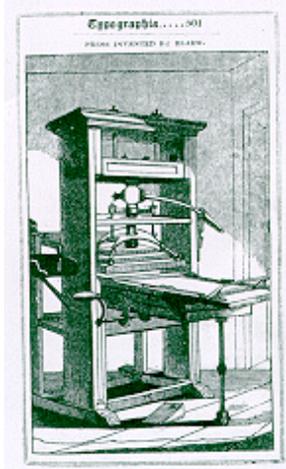
1726 "A Voyage to Brobdingnag from *Gulliver's Travels*

During this storm . . . we were carried by my computation about five hundred leagues to the east, so that the oldest sailor on board could not tell in what part of the world we were . . .

On the 16th day of June 1703, a boy on the top-mast discovered land. On the 17th we came in full view of a great island or continent . . . [with] a creek too shallow to hold a ship of above one hundred tons. We cast anchor within a league of this creek, and our captain sent a dozen of his men well armed in the long boat, with vessels for water, if any could be found. I desired his leave to go with them, that I might see the country, and make what discoveries I could. When we came to land we saw no river or spring, nor any sign of inhabitants I returned gently down towards the creek; and the sea being in full view, I saw

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our men already got into the boat, and rowing for life to the ship . . . I observed a huge creature walking after them in the sea, as fast as he could: he waded not much deeper than his knees, and took prodigious strides: but our men had the start of him half a league, and . . . the monster was not able to overtake the boat . . . [I] then climbed up a steep hill, which gave me some prospect of the country. I found it fully cultivated; but that which first surprized me was the length of the grass, which in those grounds seemed to be kept for hay, was above twenty foot high . . . I was an hour walking to the end of this field; which was fenced in with a hedge of at least one hundred and twenty foot high, and the trees so lofty that I could make no computation of their altitude . . . I discovered one of the inhabitants in the next field advancing towards the stile, of the same size with him whom I saw in the sea pursuing our boat. He appeared as tall as an ordinary spire-steeple; and took about ten yards at every stride, as near as I could guess. I was struck with the utmost fear and astonishment, and ran to hide myself in the corn . . . I came to a part of the field where the corn had been laid by the rain and wind: here it was impossible for me to advance a step . . . Being quite dispirited with toil, and wholly overcome by grief and despair, I lay down between two ridges, and heartily wished I might there end my days . . . In this terrible agitation of mind I could not forbear thinking of Lilliput, whose inhabitants looked upon me as the greatest prodigy that ever appeared in the world; where I was able to draw an imperial fleet in my



17th century—Printing press used by Willem Janszoon Blaeu to print atlases. From a 19th-century book on typography.

Courtesy of the Peabody Library The Johns Hopkins University

hand, and perform those other actions which will be recorded for ever in the chronicles of that empire, while posterity shall hardly believe them, although attested by millions. I reflected what a mortification it must prove to me to appear as inconsiderable in this nation, as one single Lilliputian would be among us. But, this I conceived was to be the least of my misfortunes: for, as human creatures are observed to be more savage and cruel in proportion to their bulk; what could I expect but to be a morsel in the mouth of the first among these enormous barbarians, who should happen to seize me? Undoubtedly philosophers are in the right when they tell us, that nothing is great or little, otherwise than by comparison: it might have pleased fortune to let the Lilliputians to find some nation, where the people were as diminutive with respect to them as they were to me. And who knows but that even this prodigious race of mortals might be equally overmatched in some distant part of the world, whereof we have yet no discovery?

Jonathan Swift, 1667-1745: Swift, an Irish clergyman, was perhaps the foremost satirist in the English language. *Gulliver's Travels*, published in 1726, is a political satire purporting to detail the travels of Lemuel Gulliver.

Swift, Jonathan. *Gulliver's Travels*. New York: Alfred A. Knopf, 1991, pp. 85-89.

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ca. 1761—John Harrison's marine chronometer number four. This was the earliest accurate way of measuring longitude at sea.

Courtesy of the National Maritime Museum, London

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1805 The Lewis and Clark expedition

Washington, June 19, 1803

Dear Clark

. . . From the long and uninterrupted friendship and confidence which has subsisted between us I feel no hesitation in making to you the following communication under the fulest impression that it will be held by you inviolably secret untill I see you, or you shall hear again from me.

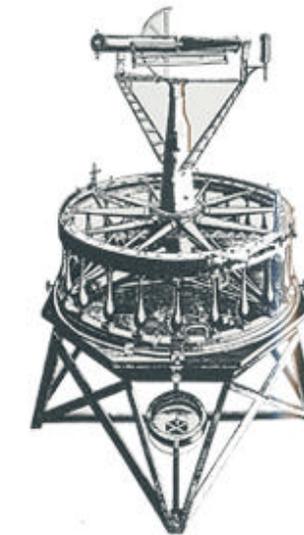
During the last session of Congress a law was passed . . . intiled “An Act making an appropriation for extending the external commerce for the United States.” The object of this Act . . . was to give the sanction of the government to exploreing the interior of the continent of North America, or that part of it bordering on the Missourie & Columbia Rivers.

This enterprise has been confided to me by the President, and in consequence since the begining of March I have been engaged in making the necessary preparations for the tour, these arrangements being now nearly completed, I shall set out for Pittsburgh .

. . . My plan: it is to descend the Ohio in a keeled boat of about ten tons burthen, from Pittsburgh to it’s mouth, thence up the Mississippi to the mouth of the Missourie, and up that river as far as it’s navigation is practicable with a boat of this discription, there to prepare canoes of bark or raw-hides, and proceed to it’s source, and if practicable pass over to the waters of the Columbia or Origan River and by descending it reach the Western Ocean; the mouth of this river lies about one hundred and forty miles South of Nootka-Sound, at which place there is a considerable European Tradeing establishment, and from which it will be easy to obtain a passage to the United States by way of the East-Indies in some of the trading vessels that visit Nootka Sound annually, provided it should be thought more expedient to do so, than to return by the rout I had pursued in my outward bound journey You must know in the first place that very sanguine expectations are at this time formed by our Government that the whole of that immense country wartered by the Mississippi and it’s tributary

streams, Missourie inclusive, will be the property of the U. States in less than 12 Months from this date: but here let me again impress you with the necessity of keeping this matter a perfect secret. In such a state of things therefore as we have every reason to hope, you will readily conceive the importance to the U. States of an early friendly and intimate acquaintance with the tribes that inhabit that country, that they should be early impressed with a just idea of the rising importance of the U. States and of her friendly dispositions towards them as also her desire to be come usefull to them by furnishing them through her citizens with such articles by way of barter as may be desired by them or usefull to them. The other objects of this mission are scientific, and of course not less interesting to the U. States than to the world generally, such is the ascertaining by celestial observation the geography of the country through which I shall pass; the names of the nations who inhabit it,

the extent and limitts of their several possessions, their relation with other tribes and nations; their language, traditions, and monuments; their ordinary occupations in fishing, hunting, war, arts, and the implements for their food, clothing and domestic accomodation; the diseases prevalent among them and the remedies they use; the articles of commerce they may need or furnish, and to what



1787 Jesse Ramsden. Theodolite. This precision surveying instrument was used in the national survey of Britain.

Courtesy of the Peabody Library The Johns Hopkins University

extent; the soil and face of the country; it’s growth and vegetable productions, its animals;

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the mineral productions of every description; and in short to collect the best possible information relative to whatever the country may afford as a tribute to general science.

My Instruments for celestial observation are an excellent set and my supply of Indian presents is sufficiently ample.

Articles wanted by Captain Lewis.

Mathematical Instruments

- ! 1 Hadley's quadrant
- ! 1 Mariner's Compass & 2 pole chain
- ! 1 Set of plotting instruments
- ! 3 Thermometers
- ! 1 Cheap portable Microscope
- ! 1 Pocket Compass
- ! 1 brass Scale one foot in length
- ! 6 Magnetic needles in small straight silver or brass cases opening on the side with hinges.
- ! 1 Instrument for measuring made of tape with feet & inches marked on it. . .
- ! 2 Hydrometers
- ! 1 Theodolite
- ! 1 Set of planespheres
- ! 2 Artificial Horizons
- ! 1 Patent log
- ! 6 papers of Ink powder
- ! 4 Metal Pens brass or silver
- ! 1 Set of Small Slates & pencils
- ! 2 Creyons
- ! Sealing wax one bundle
- ! 1 Miller's edition of Lineus in 2 Vol:
- ! Books
- ! Maps
- ! Charts
- ! Blank Vocabularies
- ! Writing paper
- ! 1 Pair large brass money scales with two setts of weights the one of Troy and the other of Averd.

**Meriwether Lewis, 1774-1809,
and William Clark, 1769-1838:**

Commissioned by Thomas Jefferson to explore the west, Lewis and Clark set off from St. Louis in 1804 traveling by boat and over land to the Pacific, returning in 1806. They did not find the fabled "northwest passage," but they compiled exhaustive scientific information about the regions they visited.

Thwaites, R.G., ed. *Original Journal of the Lewis and Clark Expedition, 1804-1806*. New York: Arno Press, 1969, vol. 7, pp. 228-9, 231, 237.

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1878 Tom Sawyer Abroad

The city went on dropping down, and down, and down; but we didn't seem to be doing nothing but just hang in the air and stand still. The houses got smaller and smaller, and the city pulled itself together, closer and closer, and the men and wagons got to looking like ants and bugs crawling around, and the streets like thread and cracks; and then it all kind of melted together, and there wasn't any city any more; it was only a big scar on the earth, and it seemed to me a body could see up the river and down the river about a thousand miles, though of course it wasn't so much. By and by the earth was a ball—just a round ball, of a dull color, with shiny stripes wriggling and winding around over it, which was rivers. The Widder Douglas always told me the earth was round like a ball, but I never took any stock in a lot of them superstitions o' hers, and of course I paid no attention to that one, because I could see myself that the world was the shape of a plate, and flat

There was one thing that kept bothering me, and by and by I says:

"Tom, didn't we start east?"

"Yes"

"How fast have we been going?"

"Well, you heard what the professor said when he was raging around. Sometimes, he said, we was making fifty miles an hour,

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sometimes ninety, sometimes a hundred. . .

“Well, then, it’s just as I reckoned. The professor lied.”

“Why?”

“Because if we was going so fast we ought to be past Illinois, oughtn’t we?”

“Certainly.”

“Well, we ain’t.”

“What’s the reason we ain’t?”

“I know by the color. We’re right over Illinois yet. And you can see for yourself that Indiana ain’t in sight.”

“I wonder what’s the matter with you, Huck. You know by the color?”

“Yes, of course I do.”

“What’s the color got to do with it?”

“It’s got everything to do with it. Illinois is green, Indiana is pink. You show me any pink down here, if you can. No, sir; it’s green.”

“Indiana pink? Why, what a lie!”

“It ain’t no lie; I’ve seen it on the map, and it’s pink.” . . .

“These clocks. They’re chronometers. You always read about them in sea voyages. One of them is keeping Grinnage time, and the other is keeping St. Louis time, like my watch. When we left St. Louis it was four in the afternoon by my watch and this clock, and it was ten at night by this Grinnage clock, Well, at this time of the year the sun sets at about seven o’clock. Now I noticed the time yesterday evening when the sun went down, and it was half-past five o’clock by the Grinnage clock, and half past 11 A.M. by my watch and the other clock. You see, the sun rose and set by my watch in St. Louis, and the Grinnage clock was six hours fast; but we’ve come so far east that it comes within less than half an hour of setting by the Grinnage clock now, and I’m away out—more than four hours and a half out. You see, that meant that we was closing up on the longitude of Ireland, and would strike it before long if we was p’inted right—which we wasn’t. No sir, we’ve been a-wandering—wandering ’way down south of east, and it’s my opinion we are in Africa . . .

Mark Twain (Samuel L. Clemens), 1835-1910:

American humorist and journalist. Twain’s *Tom Sawyer Abroad* continues the adventures of Tom Sawyer and Huck Finn as they take a balloon flight in the company of an eccentric professor.

Clemens, Samuel L. (Mark Twain). *Tom Sawyer Abroad*. New York: Harper and Brothers, 1878, pp. 21, 28, 55.

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1893 A country as a map

“That’s another thing we’ve learned from *your* Nation,” said Mein Herr, “map-making. But we’ve carried it much further than *you*. What do you consider the *largest* map that would be really useful?”

“About six inches to the mile.”

“Only *six inches!*” exclaimed Mein Herr. “We very soon got to six *yards* to the mile. Then we tried a *hundred* yards to the mile. And then came the grandest idea of all! We actually made a map of the country, on the scale of a *mile to the mile!*”

“Have you used it much?” I enquired.

“It has never been spread out, yet,” said Mein Herr: “the farmers objected: they said it would cover the hole country and shut out the sunlight! So now we use the country itself, as its own map, and I assure you it does nearly as well.”

Lewis Carroll, (Charles Lutwidge Dotson), 1832-

1898: English writer and mathematician. His two most famous books were *Alice’s Adventures in Wonderland* (1865) and *Through the Looking Glass* (1872).

Lewis Carroll. *Sylvie and Bruno Concluded*. London: Macmillan and Co., 1893, p. 169.

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1902 A passion for maps

Now when I was a little chap I had a passion for maps. I would look for hours at South America, or Africa, or Australia, and lose myself in the glories of exploration. At that time there were many blank spaces on the earth, and when I saw one that looked particularly inviting on a map (but they all look like that) I would put my finger on it and say, "When I grow up I will go there."



Joseph Conrad 1857-1924: A Polish writer who, after a career in the British Navy, chose to live in England and write in English. His travels on a steamer on the Congo River were the basis for the *Heart of Darkness* (1902).

Conrad, Joseph. *Heart of Darkness and the Secret Sharer*.
New York: New American Library, 1950, pp.70-71.

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1914 Shackleton's trip to Antarctica

November 18 [1913]. It is possible that we have reached the windless area around the Pole, for the Barrier is a dead, smooth, white plain, weird beyond description, and having no land in sight, we feel such tiny specks in the immensity around us. . . It seems as though we were in some other world, and yet the things that concern us most for the moment are trivial, such as split lips and big appetites. . . All the time we are moving south to our wished-for goal, and each day we feel that another gain has been made. We did 15 miles 500 yards today.

January 6 [1914]. This must be our last outward march with the sledge and camp equipment.

Tomorrow we must leave camp with some food, and push as far south as possible, and then plant the flag. . . . Blowing hard tonight, I would fail to explain my feelings if I tried to write them down, now that the end has come. There is only one thing that lightens the disappointment, and that is the feeling that we have done all we could. It is the forces of nature that have prevented us from going right through. I cannot write more.

January 7. A blinding, shrieking blizzard all day, with the temperature ranging from 60E to 70E of frost. It has been impossible to leave the tent, which is now snowed up on the lee side. We have been lying in our bags all day, only warm at food time, with fine snow making through the walls of the worn tent and covering our bags. We are greatly cramped. Adams is suffering from cramp every now and then. We are eating our valuable food without marching.

January 8. Again all day in our bags, suffering considerably physically from cold hands and feet, and from hunger, but more mentally, for we cannot get on south, and we simply lie here shivering. Every now and then one of our party's feet go, and the unfortunate beggar has to take his leg out of the sleeping-bag and have his frozen foot nursed into life again by placing it inside the shirt, against the skin of his almost equally unfortunate neighbor.

January 9. Our last day outwards. We have shot our bolt, and the tale is latitude 88E 23' South, longitude 162E East. The wind eased down at 1 a.m. and at 2 a.m. were up and had breakfast. At 4 a.m. started south, with the Queen's Union Jack, a brass cylinder containing stamps and documents to place at the furthest south point, camera, glasses and compass. At 9 a.m. we were in 88E 23' South,

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half running and half walking over a surface much hardened by the recent blizzard. It was strange for us to go along without the nightmare of a sledge dragging behind us. We hoisted her Majesty's flag and the other Union Jack afterwards, and took possession of the plateau in the name of her Majesty. While the Union Jack blew out stiffly in the icy gale that cut us to the bone, we looked south with our powerful glasses, but could see nothing but the dead white snow plain. There was no break in the plateau as it extended towards the Pole, and we feel sure that the goal we have failed to reach lies on this plain. We stayed only a few minutes, and then, taking the Queen's flag and eating our scanty meal as we went, we hurried back and reached our camp about 3 p.m. We were so dead tired that we only did two hours' march in the afternoon and camped at 5:30 p.m. The temperature was minus 19E Fahr. Fortunately for us, our tracks were not obliterated by the blizzard; indeed, they stood up, making a trail easily followed. Homeward bound at last. Whatever regrets may be, we have done our best.



Earnest Henry Shackleton 1874-1922: This British explorer went to Antarctica with Scott in 1901 and reached the south magnetic pole in 1909. On his third expedition in 1914 his ship, the *Endurance*, was caught in pack ice and crushed, stranding the men. They crossed the open ocean in a small boat, and were eventually rescued by a Chilean ship in 1916.

Shackleton, E.H. *The Heart of the Antarctic*, Philadelphia: J.B. Lippincott Co. 1909, v. 1. pp. 283, 341, 343.

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1947 Mapping the ocean floor

The drawing assembled by Tharp in 1952 of the first six transatlantic profiles, using echo-sounding records of the *Atlantis I* and some other early vessels, showed a prominent valley at the crest of the

Mid-Atlantic Ridge. . . this central valley also coincided with the earthquake epicentres if one drew a circle of error about them. Notwithstanding this divergence of accuracy Heezen recognized this correlation of a central valley and earthquakes as a valid one. . . . Using earthquake epicentres where there were no soundings, plotting of the position of the valley was continued about the globe. The extension of the valley into the narrow Gulf of Aden and southward into the Rift Valley of East Africa finally convinced Heezen in mid-1953 that the Mid-Oceanic Rift Valley was a globe-encircling, tensional feature throughout its 70,000 kilometres length. . . . The presence of an expanding ridge in mid-ocean favoured the concept of continental drift. . . .

The general concept that the earth is a shrinking globe was widely held in the 1940's. . . Heezen's evidence for tensional features in the oceans and the work of Carey. . . on land combined to demolish the shrinking earth hypothesis. . . The theory of plate tectonics, in which the additions of mantle material to the crust at the crest of the Mid-Oceanic Rift Valley is balanced by the subduction of crustal material into the trenches, is presently the most favoured explanation of continental drift of rigid plates on a globe of constant volume.

In 1952 Heezen and Tharp decided to make a map of the North Atlantic Ocean floor. . . . By then Heezen had been on enough cruises to have the structural outline of the Atlantic well in mind. He seized a piece of paper with an hour or so drew in the topography. . . . The physiographic diagram was completed five years later with the actual soundings and profiles. All mapping proceeded with the following principles. First, there is only one proper way to sketch or to contour the ocean floor and that is to present it as it actually exists as it would be seen if all the water were drained away. But there will never be enough tracks to do this. Thus, hypotheses of ocean floor structure must be used to supplement the often

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meager data and only the use of correct hypotheses will result in maps closely approximating nature. Second, what data exist in the several disciplines must all be put at one scale. Third, sketching proceeds from the shoreline seawards and then from the mid-ocean crest landwards as the policy was to go from the known to the unknown, from the relatively well surveyed areas toward unsurveyed areas. The sketching technique was well suited to portraying sea floor topography since it was very demanding where profiles were available but flexible where there were no data. . . .

Marie Tharp and Bruce Heezen, scientists at Columbia University's Lamont-Doherty Observatory, mapped the bottoms of the world oceans.

Tharp, Marie. "Mapping the Ocean Floor—1947 to 1977," in Scrutton, R.A. and Talwani, M. *The Ocean Floor*. New York: John Wiley & Sons, Ltd., 1982, pp.19-31.

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1969 First man on the moon

I set to work on the navigation experiments, the purpose of which in essence was to find some way to adjust man's natural inclination to navigate from reference points on earth to some system of exact navigation in space. . . In the early 1960's, when the Apollo program was not yet in existence, Dr. Richard Batten, a professor of astronautics at MIT, and one of my thesis advisers, presented some theories on travel in space. These were recalled years later and reapplied to the Apollo program. A plan was developed whereby we could make measurements between a star and a landmark on earth—or the horizon of the earth—and as you measured this one angle over and over again and fed the information to the computer along with many other star sightings, a nearly exact knowledge of the spacecraft's course could be maintained. The readings were done by taking sextant sightings. This system gained much credence in the Apollo program, and I was pleased to be part of it.

As the programs expanded and the confidence in earth-bound tracking grew, the subject of on-board navigation sightings fed into the computer became the topic for a Black Friday meeting. . . Previously a computer program automatically instructed the astronauts on how to leave a lunar orbit for a return to earth in the absence of earthbound tracking data. Should communication with the earth be permanently halted, the computer on board the spacecraft would take over and compute the maneuver in case of such an emergency. The program itself was complicated and tended to crowd the computer's bank of information. . . One Black Friday this computer program was thrown out. It was called "Return to Earth." If the eventuality ever arose, man could do the job based on information on his maneuver pads.

The voyage to the moon was conducted within nearly half a second of the flight plan. Of all the various midcourse corrections it was possible to make en route to and from the moon, we had used only two. The training and preparation was such that even the unfamiliar surface of the moon was very nearly as we had been led to expect. I realized I wasn't in the simulator and it was a good bit more real, but virtually nothing was unexpected, the extensive studies and preparations were that good.

Edwin A. "Buzz" Aldrin, Jr., and Neil Armstrong, astronauts aboard Apollo 11 were the first Americans to walk on the Moon, on July 24, 1969.

Aldrin, Jr., E. A., and Warg, W. *Return to Earth*. New York: Random House, 1973, pp. 198, 203, 241.

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1971 Moon - noon

The whole panorama spun below us every two hours as we orbited the moon. We were looking down at some strange territory when it was what we call moon-noon. With the sun directly overhead, it was 250 degrees F. I don't think we could survive that, even in the Lunar Module. But we didn't have to, because we were scheduled to land in the early morning and leave before noon. Although we planned to spend three days on the surface of the moon, this was easy because these were "earth" days. One moon day is equal to twenty-eight earth days. So we could land in early light, spend three days, and get off before 9 a.m. in moon terms.

James B. Irwin, an astronaut aboard Apollo 15 landed on the Moon on August 7, 1971. He spent 19 hours out of the lunar module exploring the terrain.

Irwin, J. B. *To Rule the Night—The Discovery Voyage of Astronaut Jim Irwin*. Nashville: Broadman Press, 1973, p. 54.



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1987 The Songlines

It was during his time as a school-teacher that Arkady learned of the labyrinth of invisible pathways which meander all over Australia and are known to Europeans as 'Dreaming-tracks' or 'Songlines;' to the Aborigines as the 'Footprints of the Ancestors' or the 'Way of the Law'.

Aboriginal Creation myths tell of the legendary totemic beings who had wandered over the continent in the Dreamtime, singing out the name of everything that crossed their path—birds, animals, plants, rocks, waterholes—and so singing the world into existence. . . .

We sat in silence until Arkady, judging the moment, turned to Alan and asked quietly in English, 'So what's the story of this place, old man?'

Alan gazed into the fire without twitching a muscle. The skin stretched taut over his cheekbones and shone. Then, almost imperceptibly, he tilted his head towards the man in blue, who got to his feet and began to mime (with words of pidgin thrown in) the travels of the Lizard Ancestor.

It was a song of how the lizard and his lovely young wife had walked from northern Australia to the Southern Sea, and of how a southerner had seduced the wife and sent him home with a substitute.

I don't know what species of lizard he was supposed to be: . . . a 'road-runner' or one of those rumped, angry-looking lizards with ruffs around their necks. All I do know is that the man in blue made the most lifelike lizard you could ever hope to imagine.

He was male and female, seducer and seduced. He was glutton, he was cuckold, he was weary traveller. He would claw his lizard-feet sideways, then freeze and cock his head. He would lift his lower lid to cover the iris, and flick out his lizard-tongue. . . .

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The performance had lasted not more than three minutes. . . . What we had witnessed he [Arkady] said, was not of course the real Lizard song, but a ‘false front’, or sketch performed for strangers. The real song would have named each waterhole the Lizard Man drank from, each tree he cut a spear from, each cave he slept in, covering the whole long distance of the way. . . .

Arkady and I sat mulling over this story of an antipodean Helen. The distance from here to Port Augusta, as the crow flew, was roughly 1,100 miles, about twice the distance—so we calculated—from Troy to Ithaca. We tried to imagine an Odyssey with a verse for every twist and turn of the hero's ten-year voyage.

I looked at the Milky Way and said, ‘You might as well count the stars.’ . . .

Regardless of the words, it seems the melodic contour of the song describes the nature of the land over which the song passes. So, if the Lizard man were dragging his heels across the salt-pans of Lake Eyre, you could expect a succession of long flats, like Chopin's ‘Funeral March’. If he were skipping up and down the MacDonnell escarpments, you'd have a series of arpeggios and glissandos, like Liszt's ‘Hungarian Rhapsodies’.

Certain phrases, certain combinations of musical notes, are thought to describe the action of the Ancestor's *feet* An expert songman, by listening to their order of succession, would count how many times his hero crossed a river, or scaled a ridge—and be able to calculate where, and how far along a Songline he was. . . .

‘So a musical phrase’, I said, ‘is a map reference?’

‘Music’, said Arkady, ‘is a memory bank for finding one's way about the world.’

Chatwin, Bruce. *The Songlines*. New York; Viking Penguin Books, 1987, pp. 2, 105.

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1991 Maps and reality

. . . To portray meaningful relationships for a complex, three-dimensional world on a flat sheet of paper or a video screen, a map must distort reality. As a scale model, the map must use symbols that almost always are proportionally much bigger or thicker than the features they represent. To avoid hiding critical information in a fog of detail, the map must offer a selective incomplete view of reality. There's no escape from the cartographic paradox; to present a useful and truthful picture, an accurate map must tell white lies.

. . . Map users generally are a trusting lot: they understand the need to distort geometry and suppress features, and they believe the cartographer really does know where to draw the line, figuratively as well as literally. As with many things beyond their full understanding, they readily entrust mapmaking to a priesthood of technically competent designers and drafters working for government agencies and commercial firms. Yet cartographers are not licensed, and many mapmakers competent in commercial art or the use of computer workstations have never studied cartography. Map users seldom, if ever, question these authorities, and they often fail to appreciate the map's power as a tool of deliberate falsification or subtle propaganda.

Monmonier, Mark. *How to Lie with Maps*. Chicago: University of Chicago Press, 1991, p. 1.

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1991—The surface of Venus.
Synthetic aperture radar mosaics
created from data obtained by the
Magellan spacecraft.

Courtesy of the National Aeronautics
and Space Administration

1992 The art and science of maps

... every map is the sum not only of the cartographer's skills, but of the many explorers who win the territory in the first place. Thus the map is both aesthetic and informational, as individual as any work of art but also communal and consensual, the product of cultural values (especially the value of exploration itself) and accumulated wisdoms. And perhaps in that moment the germ of an idea unconsciously took root, the idea of the map as an object that straddles the worlds of art and science, one of the few bridges linking the two cultures.

Hall, Steve S. *Mapping the Next Millennium—The Discovery of New Geographies*. New York; Random House, 1992, p. xii.

1992 Maps invite action

Maps invite action. Exploration, conquest, occupation, exploitation, administration, and organization—action seems always inflicted upon the bare outlines of a map, and the action can take many forms: a military campaign or a vacation, a dispute over property boundaries or a claim staked by a mining enterprise, dreams of a slave republic or the movement of the scalpel toward a hidden lesion of the brain.

Hall, Steven S. *Mapping the Next Millennium—The Discovery of New Geographies*. New York; Random House, 1992, p. 383.

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